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## Materials Investigations by Transmission Electron Microscopy

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The dual character of the electron makes it an excellent tool 21.05.2009

for investigation of condensed matter. After the first scattering experiment 1927 an electron microscope was constructed by Knoll and Ruska in the Siemens factory in 1932. The accelerated electrons interact in a number of ways with the sample. In addition to elastic and inelastic scattering of electrons in transmission characteristic x-rays, back-scattered and secondary electrons are produced. Thus information on the elemental composition as well as on the crystal structure is obtained. The inelastic scattering leads to inelastic energy loss scattering (EELS) which provides information on the valence state of light elements and is thus complementary to energy dispersive x-ray scattering (EDX).

High resolution transmission electron microscopy (HRTEM) provides evidence of many kinds of crystal defects and of the structure of interfaces. Convergent beam electron diffraction may elucidate the precise symmetry of even small amounts of material and the distribution of valence electrons. The structure determination is supported by simulation and modelling techniques. Direct structure determination based on the intensity of reflections is called electron crystallography. Some applications from nanocrystalline powders and interfaces will be given.



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